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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/741,498	12/19/2003	Date-Gun Lee	20067/OPP031055US	6293
34431	7590	02/04/2005	EXAMINER	
HANLEY, FLIGHT & ZIMMERMAN, LLC			LEE, CALVIN	
20 N. WACKER DRIVE			ART UNIT	
SUITE 4220			PAPER NUMBER	
CHICAGO, IL 60606			2818	

DATE MAILED: 02/04/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/741,498

Applicant(s)

LEE, DATE-GUN

Examiner

Calvin Lee

Art Unit

2818

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
 Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-7 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-3 is/are rejected.
- 7) ☒ Claim(s) 4-7 is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 19 December 2003 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. ____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. ____. |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date <u>12/19/03</u> . | 6) <input type="checkbox"/> Other: ____. |

OFFICE ACTION

Specification

1. The disclosure is objected to because of the following informalities:
Paragraph 0015, line 5, replace "following a process of" with --a following process of--
Paragraph 0019, line 9, replace "the thickness of the photoresist pattern" with --the etch rate of the photoresist pattern--

Drawings

2. Figures 1A and 1B should be designated by a legend such as --Prior Art-- because only that which are old is illustrated. See MPEP § 608.02(g). Corrected is required in reply to the Office action to avoid abandonment of the application.

Claim Rejections - 35 U.S.C. § 103

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 103 that form the basis for the rejections under this section made in this Office action:

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 1-2 are rejected under 35 U.S.C. 103(b) as unpatentable over *Applicant's Prior Art (APA)* in view of *Yoo (US 6,744,097)*, and further in view of *Ho et al (US 6,833,311)*.

APA discloses a fabrication method of a semiconductor device, comprising the steps of:
-forming a pad oxide layer 2, a nitride layer 3, and a photoresist pattern sequentially on a substrate 1
-filling the trench by depositing an oxide layer 4 on entire surface of the substrate [Fig. 1B]
-performing planarization of the trench oxide layer by CMP [¶ 0008].
a) *APA* does not disclose etching the nitride layer and the pad oxide layer using the photoresist pattern as a mask. Nevertheless, such extra etch step of etching pad oxide and nitride alone is known in the semiconductor etching art as evidenced by *Yoo* disclosing the semiconductor device:
-sequentially forming a pad oxide layer 9, a nitride layer 8, and a photoresist pattern 7 on a substrate
-etching the nitride layer and the pad oxide layer using the photoresist pattern as a mask [Fig. 7]
while etching the silicon substrate to form a trench using the nitride layer as an etch stopper [col. 5]

It would have been obvious to a person of ordinary skill to have modified the process of *APA* by utilizing an extra step of etching the nitride layer and the oxide layer using the photoresist pattern as a mask for the purpose of preventing the underlying substrate of being over-etched with the same etch rate that has been used to remove the overlying nitride and oxide layers.

b) The combination of *APA* and *Yoo* fails to disclose performing planarization, which makes the gap filling oxide exist only in the trench. *Ho et al* discloses the same shallow trench isolation formation, comprising the step of:

- forming a pad oxide layer 101 and a nitride layer 102 sequentially on a substrate 100 [Fig, 2A]
- forming a photoresist pattern for trench formation on the nitride layer
- etching the nitride layer and the oxide layer using the photoresist pattern as a mask [col. 3, ln.33]
- etching the substrate to form a trench using the nitride layer and the oxide layer as a mask
- forming a thermal oxide layer 104, 106 on inner walls of the trench
- filling the trench by depositing an oxide layer 108 on entire surface of the substrate [col. 4]
- performing planarization which makes the gap filling oxide exist only in the trench [Fig. 2G].

It would have been obvious to a person of ordinary skill to have modified the process of *APA* and *Yoo* by utilizing a planarization to make a gap filling oxide exist only in the trench for the purpose of removing uneven oxide layer and exposing the nitride layer, which is subsequently removed, thereby achieving a preferred shallow trench isolation.

5. Claim 3 is rejected under 35 U.S.C. 103(b) as unpatentable over the combination of *APA*, *Yoo*, and *Ho et al*, as applied to claim 1, in view of *Kim et al* (US 6,573,551).

None of the cited arts teaches or suggests planarizing of a gap filling oxide by etch-back process. Nevertheless, such etch-back process is known in the etching processing art as evidenced by *Kim et al* disclosing an etch-back process (or a CMP) used to form oxide region 7 [col. 5].

It would have been obvious to a person of ordinary skill to have modified the planarization of *APA*, *Yoo*, or *Ho et al* by utilizing an etch-back process because it is a standard etching technique that somehow has been used to previously remove/etch nitride and oxide/dielectric layer.

Allowable Subject Matter

6. Claims 4-7 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. Following is the statement reason of allowance:

* The cited arts disclose neither the photoresist layer being removed simultaneously by etching the nitride layer and the silicon substrate, nor the nitride layer being over-etched at the etch stop point.

Contact Information

7. Any inquiry concerning this communication from the Examiner should be directed to *Calvin Lee* at (571) 272-1896 from 7:00AM to 5:00PM (Monday-Thursday, Eastern Time). If attempts to reach the examiner by telephone are unsuccessful, Art Unit 2825's Supervisory Patent Examiner *David C. Nelms* can be reached at (571) 272-1787.

Any inquiry relating to the status of this application should be directed to the Group receptionist whose telephone number is (703) 308-0596. The central fax number is (703) 872-9306 for all communications to be entered (e.g., amendments, remarks, IDS, etc.)



February 1, 2005